1086-VL-2539 **Rodrigo B. Platte** and **Alexander J. Gutierrez*** (ajg@asu.edu), 527 E Hermosa Dr., Tempe, AZ 85282, and **Anne Gelb**. *Edge informed Fourier reconstruction from non-uniform spectral data.*

Reconstruction of piecewise smooth functions from non-uniform Fourier data arises in sensing applications such as magnetic resonance imaging (MRI). This paper presents a new method that uses edge information to recover the Fourier transform of a piecewise smooth function from data that is sparsely sampled at high frequencies. The approximation is based on a combination of polynomials multiplied by complex exponentials. We obtain super-algebraic convergence rates for a large class of functions with one jump discontinuity, and exponential convergence for piecewise analytic functions of compact support. By casting the approximation problem in optimization form, our method can also improve initial jump location estimates, which are calculated from the available Fourier data. Finally, if the Fourier transform is approximated at integer values, then the IFFT can be used to reconstruct the underlying function. Post-processing techniques, such as spectral reprojection, can then be used to reduce Gibbs oscillations. (Received September 25, 2012)